

WHAT IS CLAIMED IS:

- 1 1. A method for contracting collagen tissue at a target site on or
2 within a patient's body comprising:
3 heating an electrically conducting fluid in the region of the target site; and
4 directing the heated electrically conducting fluid onto tissue at the target
5 site to induce contraction of collagen fibers in said tissue.

- 1 2. The method of claim 1 wherein the electrically conducting fluid is
2 heated to a temperature sufficient to substantially irreversibly contract the collagen fibers.

- 1 3. The method of claim 1 wherein the collagen fibers are heated to a
2 temperature in the range of about 45°C to 90°C.

- 1 4. The method of claim 1 wherein the collagen fibers are heated to a
2 temperature in the range of about 60°C to about 70°C.

- 1 5. The method of claim 1 wherein the heating step comprises applying
2 high frequency voltage to an electrode terminal in contact with the electrically conducting
3 fluid.

- 1 6. The method of claim 5 wherein the heating step further comprises
2 inhibiting electric current from contacting the tissue at the target site to minimize damage
3 to, or removal of, said tissue.

- 1 7. The method of claim 1 further comprising contacting the
2 electrically conducting fluid with a return electrode to provide a current flow path from
3 the electrode terminal, through the electrically conducting fluid, and to the return
4 electrode.

- 1 8. The method of claim 7 further comprising maintaining a space
2 between the electrode terminal and the tissue to inhibit electric current from directly
3 contacting said tissue.

1 9. The method of claim 8 wherein the space between the electrode
2 terminal and the tissue is between about 5 to 30 mm.

1 10. The method of claim 7 wherein the return electrode is positioned
2 proximal to the electrode terminal to induce current flow from the electrode terminal
3 away from the target site.

1 11. The method of claim 1 further comprising directing the electrically
2 conducting fluid along a fluid path past the electrode terminal and to the target site.

1 12. The method of 7 further comprising directing the electrically
2 conducting fluid past the return electrode to generate the current flow path between the
3 return electrode and the electrode terminal.

1 13. The method of claim 7 further comprising supplying the electrically
2 conductive fluid to a proximal end of an axial lumen defined by the return electrode and
3 directing the fluid through a distal end of the axial lumen to the electrode terminal.

1 14. The method of claim 5 further comprising immersing the target site
2 within a supply of the electrically conductive fluid and heating the electrically conducting
3 fluid in the region of the electrode terminal sufficiently to propel the heated electrically
4 conducting fluid away from the electrode terminal to the target tissue.

1 15. The method of claim 14 further comprising positioning a return
2 electrode within the supply of electrically conductive fluid to generate the current flow
3 path between the target site and the return electrode.

1 16. The method of claim 1 wherein the electrode terminal comprises an
2 electrode array including a plurality of electrically isolated electrode terminals.

1 17. The method of claim 1 further comprising:

supporting the electrode terminal with an electrosurgical probe having a tissue treatment surface near a distal end of the probe, wherein the electrode terminal is substantially flush with the tissue treatment surface.

18. The method of claim 1 further comprising applying RF frequency voltage to a plurality of electrically isolated electrode terminals within the electrically conducting fluid.

19. The method of claim 18 further comprising independently controlling current flow from at least two of the electrode terminals based on impedance between the electrode terminal and a return electrode

20. The method of claim 1 wherein the electrically conductive fluid comprises isotonic saline.

21. The method of claim 1 further comprising applying RF frequency voltage to at least one electrode terminal within the electrically conducting fluid, the voltage being in the range of about 20-90 volts rms

22. A method for contracting collagen tissue at a target site on or within a patient's body comprising:

positioning a tissue treatment surface of an electrode terminal in close proximity to the target site in the presence of an electrically conducting fluid;

contacting the electrically conducting fluid with a contact surface of a return electrode to generate a current flow path between the electrode terminal and the return electrode; and

applying high frequency voltage to the electrode terminal and the return electrode, the voltage being sufficient to induce a contraction of collagen fibers at the target site without causing dissociation or molecular breakdown of the collagen fibers.

23. The method of claim 22 further comprising controlling a depth of tissue penetration of the electric current into the tissue to control a depth of thermal heating of said tissue.

1 24. The method of claim 23 wherein the controlling step is carried out
2 by controlling a frequency of the voltage applied to the electrode terminal and the return
3 electrode.

1 25. The method of claim 23 wherein the controlling step is carried out
2 by controlling a diameter of the electrode terminal.

1 26. The method of claim 23 wherein the electrode terminal is supported
2 at a distal end of an electrosurgical probe and the controlling step is carried out by
3 controlling a distance between an outer perimeter of the probe and the electrode terminal.

1 27. The method of claim 24 wherein the voltage has a frequency of less
2 than 350 kHz.

1 28. The method of claim 24 wherein the voltage has a frequency of
2 about 100 to 200 kHz.

1 29. The method of claim 23 wherein the depth of tissue heating is less
2 than about 3.5 mm.

1 30. The method of claim 23 wherein the depth of tissue heating is less
2 than about 0.5 mm.

1 31. The method of claim 23 wherein the controlling step further
2 comprises positioning the return electrode such that electric current flows from the
3 electrode terminal away from the target site to the return electrode.

1 32. The method of claim 22 further comprising heating the electrically
2 conductive fluid adjacent the electrode terminal with the high frequency voltage and
3 propelling the heated fluid to the tissue at the target site to apply thermal energy to the
4 tissue.

1 33. The method of claim 24 wherein the thermal energy is sufficient to
2 induce contraction of the collagen fibers at the target site and low enough to minimize
3 molecular dissociation or breakdown of the tissue.

1 34. The method of claim 22 wherein the voltage difference applied
2 between the return electrode and the electrode terminal is about 30 to 70 volts rms.

1 35. A surgical instrument for applying high frequency electrical energy
2 to tissue at a target site comprising:

3 a shaft having a proximal end and a distal end;
4 an electrically insulating support at or near the distal end of the shaft, the
5 electrically insulating support having a tissue treatment surface;
6 an electrode array comprising at least three electrode terminals at least
7 partially embedded within the electrically insulating support, wherein the electrode
8 terminals are substantially flush with the tissue treatment surface of the electrically
9 insulating support; and

10 one or more connectors extending from the electrode terminals to the
11 proximal end of the shaft.

1 36. The surgical instrument of claim 34 further comprising a return
2 electrode positioned on the shaft proximal to the electrode array.

1 37. The surgical instrument of claim 35 wherein the electrode terminals
2 are electrically isolated from each other.

1 38. The surgical instrument of claim 35 further comprising at least five
2 electrode terminals embedded within the electrically insulating support.

1 39. The surgical instrument of claim 35 wherein the electrically
2 insulating support comprises an inorganic material selected from the group consisting
3 essentially of glass, ceramic and glass/ceramics.

1 40. The surgical instrument of claim 35 wherein the return electrode is
2 a substantially annular band positioned proximal to the electrode array.

1 41. The surgical instrument of claim 35 wherein the electrode terminals
2 each have a tissue treatment surface substantially flush with the tissue treatment of the
3 electrically insulating support so as to minimize dissociation and breakdown of collagen
4 fibers in the tissue and to minimize ablation of tissue surrounding the collagen fibers

1 42. The surgical instrument of claim 41 wherein the tissue treatment
2 surfaces of the electrode terminals each have a surface area less than about 1 mm².

1 43. The surgical instrument of claim 41 wherein a distal portion of the
2 shaft is bent such that the electrode terminals have a tissue treatment surface that is non-
3 perpendicular to the longitudinal axis of the shaft.

1 44. A system for applying high frequency electrical energy to a tissue
2 at a target site comprising:

3 an electrosurgical probe having a shaft with proximal and
4 distal ends and at least one electrode terminal at or near the distal end;

5 a fluid delivery element for delivering electrically
6 conductive fluid to the target site;

7 a return electrode spaced from the electrode terminal; and

8 an electrosurgical power supply for applying high
9 frequency voltage to the electrode terminal and the return electrode, the voltage being
10 sufficient to induce contraction of collagen fibers within the tissue.

1 45. The system of claim 44 wherein the return electrode is positioned
2 to draw electric current from the electrode terminal away from the tissue at the target
3 site.

1 46. The system of claim 44 wherein the return electrode is positioned
2 on the shaft of the probe proximal to the electrode terminal

1 47. The system of claim 44 wherein the voltage is selected to heat the
2 electrically conductive fluid to a temperature sufficient to cause contraction of the
3 collagen fibers within the tissue.

1 48. The system of claim 44 wherein the voltage is selected to heat the
2 collagen fibers to a temperature of about 60°C to 70°C.

1 49. The system of claim 44 wherein the power supply comprises means
2 for controlling a depth of penetration of electric current into human tissue.

1 50. The system of claim 44 wherein the power supply has an operating
2 frequency less than 350kHz.

1 51. The system of claim 44 wherein the power supply has an operating
2 frequency between about 100 to 200 kHz.

1 52. The system of claim 44 further comprising an array of electrode
2 terminals positioned at a distal end of the electrosurgical probe, the terminals each having
3 a diameter of less than 1 mm to about 0.05 mm.

1 53. The system of claim 44 further comprising an array of electrode
2 terminals positioned at a distal end of the electrosurgical probe, the terminals being
3 spaced at least a distance of about 0.2 mm to about 0.75 mm.